SCIENTIFIC MANAGEMENT OF RESERVOIR FISHERIES

My topic--and it was my own choice of subject, not one imposed by the program committee--is a many sided one. I particularly wanted to get across a fact of life that is too often overlooked or swept under the rug; that is, that reservoir fisheries management is dependent upon the management of the reservoir. Also to reinforce a concept that is sometimes forgotten in the hurry to achieve something spectacular in management: that today, as always, it is the scientific approach that can be depended on to give us a firm and lasting foundation for effective management.

First, though, I want to say that we are proud to be one of the supporters of the symposium, both financially and through program development and program participation by its scientists.

The bright young biologist joins a reservoir research team full of vision and the academically acquired lore of science. His dream, perhaps, is to unlock the secrets of reservoir mysteries, ecology, succession of species, basic productivity, predation, fecundity, migration and feeding requirements. His dreaming goes beyond this, of course, to the day when he and his colleagues will say "Eureka! This is the way to manage this reservoir scientifically to provide dependably good fishing." And so the day comes and he and his colleagues say "Eureka! This is the way."

So the management biologists, stirred to new action and new hope cry "Eureka!" too, because they, also, have had visions and dreams. The hopes of both have come despite a knowledge of steady losses of natural fishing waters from pollution and eutrophication, diversion, and real estate and highway developments. The big, new impounded waters are the recreational hope of the future, accessible from interstate highways, reasonably protected from major deleterious changes, broad enough to encompass the competing recreational pursuits of fishing, boating, swimming and water skiing, deep enough to sustain a variety of gamey fish species at different levels, and rich enough to grow them big and wild.

Presented by John S. Gottschalk, Director, Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior, at the Reservoir Fishery Resources Symposium, Athens, Georgia, April 5, 1967.

But there is a troublesome shadow vaguely clouding this utopian description. It is the realization that in the world of reservoir fisheries management, fisheries managers are not free agents. I well recall that Dr. A. H. Wiebe, at one of the early river basin conferences nearly 25 years ago, emphatically reiterated that biologists must accommodate their programs to the central objective of the water management agency. And, indeed, today it appears that the accepted concepts and regimens of the standard lake biology can be employed only in a suggestive way, as we try to integrate fishery management, hopefully science based, into the regimen of water level fluctuations foreordained by power production, flood control, irrigation demand, and municipal water storage needs. It is the crux of the matter that the management of reservoir fishing resources depends to a very great extent on the policies and actions of people and agencies not associated with Federal or State fishery agencies.

I think all this needs to be said, not as an attack or criticism of these "other people," but so we can all think more clearly about reservoir research, reservoir management, and reservoir fishing. Water is a very valuable commodity with growing demand and critical supply. Fishing is high value recreation, as every survey has shown. Demand for fishing waters is growing too, but so are power demand and irrigation demand, municipal water and industrial demands, and cooling water demands.

So scientific management of reservoir fisheries, to be scientific and successful, takes into account the reservoir water management regimens of the Corps of Engineers, the Bureau of Reclamation, the private power companies, and the municipalities. The biological sciences, then, are tempered by accommodation and persuasion and competing interests. And perhaps my real concern in these few remarks is whether we must add a question mark to my title and thus ask, "Scientific Management of Reservoir Fisheries?"

I have made my point, and I should dwell on it no longer except to say that the presence here on the program and on this very panel this morning of some of the people I'm talking about suggests the biologists can still have their hopes and dreams. The Corps of Engineers and the Bureau of Reclamation are expressing by their presence an evident appreciation of the angler in the multiple-use equation, and of the importance of fishing in the Nation's economy. We recognize that they now rank with Mother Nature as part-time creators of what are among the larger physical manifestations of man's domination of the earth--the large, multi-purpose dam and reservoir projects.

Secretary Udall has said: "Every sign is demanding that we reassess the material base upon which we must support our exploding population. Conservation...reaches out to encompass the quality of total environment...it ponders how to stretch our resources to cover the demands of a mushrooming population and still preserve the quality of our existence."

Conservation must "ponder" well, for our population is indeed mushrooming. The United States has a population of about 196 million, growing at a rate of 1.6 percent annually. It will double at this rate in 44 years.

What is worse, our needs and use of water are predicted to triple while our population doubles and our wastes increase apace.

Heroic measures and heroic efforts will be required to reclaim and maintain significant segments of our heritage of natural waters, especially those within and nearby to our megalopolis. Obviously, intensifying urbanization and population growth will intensify the pressures on our natural waters in manifold degree.

Many reaches of our streams will become fully regulated to convey conserved water to points of use, to benefit navigation, to provide flood control, and to maintain acceptable water quality and recreation.

Many of our waters, both flowing and ponded, will be increasingly used for pumped-storage power production and as sources of cooling water for nuclear and other thermal power plants and for industry.

Many other stream reaches will have their beds inundated and their free flow stilled. Lakes, reservoirs, estuaries, and most of our rivers will be amply and even more than amply supplied with phosphates and other nutrients.

We can and must learn to manage these waters to achieve their full fishery potential.

On the other hand, some of our streams will be depleted of flow by consumptive uses, and some will continue to be less than fully productive because of unavoidable contamination and pollution--chemical and thermal.

Dredging and filling of shallow areas of our inland, estuarine, and coastal waters also will continue to cause unavoidable losses to our fisheries.

This is a desultory outlook. What will happen to the interests of the 28 million substantial fishermen who fished 523 million fishermen days in 1965? Or to the 47 million total anglers who fished 640 million days in 1965? Or more to the point, what will happen to the interests, efforts, and results of the fishing of the 98 million fishermen we anticipate by the year 2010, a rough 600 million fishermen day increase per year?

Some of this increase will be relieved by improved access to estuarine and coastal waters being provided in our National Seashores and comparable State areas. Some will be served by new fishing access sites provided along inland waters in new National and State Parks and by access site developments of State fish and game agencies. Some will be accommodated by newly opening waters now closed in domestic supply reservoirs. Some will result from clean-up of our rivers and estuaries now too severely polluted to produce fish or to provide a wholesome and attractive fishery. Some will be provided in new lakes built by public agencies especially for fishing and recreation. And some will be provided on ponds built by private interests for a variety of purposes. All of these possible additions to the fishery base can be expected to merely satisfy a part of the future fishing demand unless the art and science of our fishery management can improve production and utilization.

The real ray of hope for our fisheries in the face of this challenge is full use of the productive capacity of all our reservoirs. It is the reservoir resources that will be of greatest significance to our future recreational fisheries. The question is--how can we assure that these reservoir fishery resources will be fully utilized and that they support the highest order of recreational fishing that is practicable and feasible? In other words, what are the programs that can be forecast to meet the challenges and problems of this full use?

No longer do fishery workers decry in one voice "the big dam foolishness," although some problems remain with anadromous fish. Further, we seldom hear of big reservoirs being characterized as "biological deserts." We have much to learn about designs and operation of reservoirs and about managing their waters to maximize

the fishery, but we have come far enough to make these catch phrases outmoded. It is reasonable to expect at least a doubling of reservoir surface area as our population doubles. Thus, the available fishing area at average pool levels of medium and large reservoirs will increase from the order of 10 million acres to about 20 million acres.

This sounds like, and is, a large increase in fishing area. Actually, it is not much larger than the 7-million-acre area of Lake Erie, which is threatened by pollution and eutrophication. Hopefully, we can reclaim Lake Erie and take full advantage of the increased area of reservoirs, as well. But our sciences must be programmed to these goals.

It seems to me that we must all recognize that there has been but little scientific management of reservoir fisheries. This is partly the lack of science, or as the saying goes, "the state of the art"; partly because we fish people tried unsuccessfully to convince the water managers that our fish management proposals were worth losing power or other revenues to; and partly because we have not recognized that our science must be big, and broad, and deep enough to cope with the complexities of fishery management dominated by competing water demands.

Scientific study of big reservoirs from the standpoint of fish and fishing is only a little over 30 years old. It began on Elephant Butte Reservoir in New Mexico. Within a year of that study in 1935, the now famous TVA work began. Since then, bigger and bigger reservoirs have been put behind dams with greater challenges to the scientist and resource manager to cope with.

The living things--the biota--of a new reservoir find themselves established in a very different kind of environment from that in which they evolved. It was an environment where their responses to changes were fairly well understood or could be predicted reasonably well. River impoundment upsets the long-established balances of temperature, gaseous distribution, and energy flows of the lotic environment, sometimes over wide ranges. Naturally, with impoundment abrupt and drastic changes occur in species composition, invertebrate succession, aquatic vegetation, relative abundance of all of these, and in the biotic base which sustained them. Some fish species gradually disappear; others flourish. Relative stability is "out," dynamism is "in."

Scientific management, with an eye on and perhaps an assist from the water manipulators, can sometimes change spawning failures to successes. It can reduce overpopulations of some species, introduce new species with good survival potential, sometimes "stack" different species at the different levels they prefer.

Scientific management will consider the reservoir system of inflows and tailwaters as well as the lake in itself. Reregulation of power releases, drawing waters of desired temperature from different strata, and scheduling fluctuations of water levels to enhance fishing in and below the reservoir are commonplace enough now that we tend to forget the life history, physiological, and limnological research that led to these management techniques.

Scientific reservoir fish management will have to center on population and environmental control. The research to make this kind of management possible--and our reservoir research is aimed in this direction--seeks facts about early life histories and reproduction to identify vulnerable stages where biological or other controls can be effective for management. The research measures recruitment, mortality, competition, standing crop and carrying capacity. And the research describes the myriad environmental influences which can affect fish production. Fish populations do not lend themselves to direct observation for quantitative assessment, and there are complications from sampling methods and tools which both research and management need. So scientific management will continue to be only as scientific as the research and methodology back-up will provide tools.

Scientific management will take into account the variations in year-class strength of each species, variations in their growth rates, and fluctuations in food supply abundance, because any one or all of these may be a signal to switch to a new approach.

The fish managers, no matter how scientifically oriented, will recognize the "art of the possible." Technically, it may be desirable for a rapid drawdown, followed by chemical treatment of remaining waters to remove unwanted species before restocking. This may be sound management technique, cheap and effective in chemicals and fish removal, and good insurance of survival of newly stocked trout or striped bass or something equally good. But, if it costs the power project a million dollars in revenue, it is not possible, and it won't be done.

The manager, then, will always be seeking alternatives, or will master plan his management to include alternative courses of action. He will be in continuous dialogue with the people who call the turns by turning the valves.

The manager will take the accumulated results of reservoir research and interpret them in terms of his own problems of control, habitat improvement, fertility enhancement, tailwater and reservoir stocking, seasons, catch limits, access development, and zoning.

The mention of zoning leads into still another complication for the scientific fish manager. There are competitors besides water users to deal with, and in some places at some seasons these may be formidable, indeed. The non-fishing pleasure boaters, the water skiers, and sometimes the skin divers can impede or frustrate the biolgost even more than the single-minded dam manager. Society will have to evolve, as it is doing today in many areas, the practical solutions to these conflicts.

But eventually, it seems to me, the great hope of the future lies in placing our confidence in the capabilities of the scientific method as the base for rational management of our reservoir fisheries. We must, however, both master, and profit from, the increased sophistication of modern scientific thought.

The result can remove the question mark, and make "Scientific Management of Reservoir Fisheries" a concept capable of supplying a very important segment of the outdoor recreation needs and, yes, the food, too, of our future citizens.